

State of Illinois  
Department of Transportation  
Bureau of Materials and Physical Research

**POLICY MEMORANDUM**

January 1, 2005

Springfield

05-01

TO: REGIONAL ENGINEERS AND HIGHWAY BUREAU CHIEFS

SUBJECT: QUALITY CONTROL/ QUALITY ASSURANCE PROGRAM  
FOR PRECAST CONCRETE PRODUCTS

DEFINITIONS

**BUREAU** - Bureau of Materials and Physical Research, Illinois Department of Transportation.

**COMPONENT MATERIALS** - Materials that are used in the **Precast Concrete Product** manufacturing process. This includes cement, finely divided minerals, aggregates, water, reinforcement steel, and admixtures.

**CONCRETE TESTER** - An individual who has successfully completed the **Department's** Portland Cement Concrete Tester Course. Once trained, the Department will not require the individual to take the class again for recertification purposes. The **Concrete Tester** shall be monitored on a daily basis by an individual who has successfully completed the American Concrete Institute (ACI) Certification Program for Concrete Field Testing Technician - Grade I.

**DEPARTMENT** - Illinois Department of Transportation. The definition reference is Section 101 of the **Standard Specifications**.

**DISTRICT** - District office, Illinois Department of Transportation.

**ENGINEER** - The Director of Highways of the Department of Transportation of the State of Illinois, or authorized representative. The definition reference is Section 101 of the **Standard Specifications**.

**INSPECTOR** - A representative of the **Department** who is authorized to inspect the **Precast Concrete Products, Plant** and **Laboratory** of the **Producer**. This individual will have successfully completed the American Concrete Institute (ACI) Certification Program for Concrete Field Testing Technician – Grade I. Once trained, the **Department** will not require the individual to take the class again for recertification.

**INDEPENDENT ASSURANCE** - **Department** comparison test to provide independent checks on reliability of acceptance sampling and testing. The definition reference is the Project Procedures Guide.

**LABORATORY** - A quality control laboratory which has all the equipment necessary to perform the **Test Procedures** required by the **Specifications**.

**LOT** - A quantity of **Precast Concrete Products**, all being of like size, material, and strength designation, manufactured by the same process. The definition reference is AASHTO M 262.

**MISCELLANEOUS COMPONENTS** - Products not manufactured by the **Producer** but which are supplied to projects such as gaskets, mastic, castings, etc.

**PLANT** - A **Producer's** facility for manufacturing **Precast Concrete Product**.

**PRECAST CONCRETE PRODUCTS** - Any non-prestressed precast concrete product. This includes the products listed under the Products Key of the "Approved List of Certified Precast Concrete Producers" (<http://www.dot.il.gov/materials/precastconcreteproducers.pdf>) and other products as determined by the **Engineer**. The Products Key does not include composite concrete junction boxes (Article 1088.05 / Standard 813001-01 as it applies to polymer concrete), reinforced plastic mortar junction boxes (Article 1088.08(a)), composite concrete handholes (Article 1088.10(b) / Standards 814001 and 814006 as they apply to polymer concrete), and railroad crossings.

**PRODUCER** - Manufacturer of a **Precast Concrete Product**.

**QUALITY ASSURANCE** - All those planned and systematic actions necessary to provide adequate **Department** confidence that the **Precast Concrete Product** will satisfy given requirements for quality.

**QUALITY CONTROL** - The sum total of activities performed by the **Producer** to make sure a **Precast Concrete Product** meets the requirements of this Policy Memorandum, the **Quality Control Plan**, and **Specifications**.

**QUALITY CONTROL MANAGER** - An employee of the **Producer** who has responsibility to make sure a **Precast Concrete Product** meets the requirements of this Policy Memorandum, the **Quality Control Plan**, and **Specifications**. The **Quality Control Manager** may also have completed the **Technician** training. Refer to Section 17.2.

**QUALITY CONTROL PLAN** - A document which explains how the **Producer** proposes to control the equipment, materials, and production methods to ensure the specified **Precast Concrete Product** is obtained.

**SPECIFICATIONS** - Specifications for a **Precast Concrete Product** which includes the **Standard Specifications**, supplemental specifications and recurring special provisions, highway standards, shop drawings, contract plans, project special provisions, AASHTO Specifications, and ASTM Specifications.

**STANDARD SPECIFICATIONS** - The **Department's** Standard Specifications for Road and Bridge Construction.

**TECHNICIAN** - An individual who has successfully completed the American Concrete Institute (ACI) Certification Program for Concrete Field Testing Technician - Grade I. Once trained, the **Department** will not require the individual to take the class again for recertification purposes.

**TEST PROCEDURE** - A physical test specified in the **Specifications**. Refer to the **Department's** Manual of Test Procedures for Materials or AASHTO/ASTM publications.

## 1.0 SCOPE

This Policy Memorandum defines the **Quality Control / Quality Assurance** program for **Precast Concrete Products**.  
It includes:

1. **Producer** certification and revocation of certification.
2. **Quality Control** and **Quality Assurance** requirements.
3. Material and product acceptance, repair, and rejection **Specifications**.
4. Responsibilities of the **Producer** and the **Department**.

## 2.0 APPLICATION

- 2.1 This Policy Memorandum applies to all **Producers** who wish to be certified by the **Department** to provide **Precast Concrete Products** for projects. The **Precast Concrete Products** that the **Producer** intends to provide will be indicated on the "Approved List of Certified Precast Concrete Producers."
- 2.2 Additional products may be included in this Program as determined by the **Engineer**.
- 2.3 The **Producer** shall implement the quality control testing and inspection requirements of the Policy Memorandum for all customers, whether private, commercial, or government. This is applicable only to **Precast Concrete Products** indicated on the "Approved List of Certified Precast Concrete Producers." **Department** material requirements shall not apply to all customers. **Precast Concrete Products** which are not manufactured according to **Department** material requirements shall be marked or stored separately. Separate stockpiles shall be demarcated to the satisfaction of the **Engineer**.
- 2.4 This Policy Memorandum does not apply to precast prestressed concrete products.

### 3.0 AUTHORITY

The authority for this Policy Memorandum is cited below and is found in the ***Standard Specifications***:

1. Article 106.01- "At the option of the **Engineer**, materials may be approved at the source of supply before delivery is started."
2. Article 106.05- "The source of supply of each material used shall be approved by the **Engineer** before delivery is started."

### 4.0 ADMINISTRATION

- 4.1 The **Bureau of Materials and Physical Research** has primary responsibility for the overall administration of this Policy Memorandum.
- 4.2 The **District Materials Engineers** have primary **Quality Assurance** responsibility for the **Producers** within their **Districts** and for **Producers** located in adjacent states within 50 miles of the Illinois state line.
- 4.3 The **Bureau** has primary **Quality Assurance** responsibility for **Producers** located in adjacent states that are 50 or more miles from the Illinois state line.
- 4.4 The **Bureau** will maintain a current list of **Producers** certified to provide products under this Policy Memorandum. To view or download the "Approved List of Certified Precast Concrete Producers" on the Internet, go to: <http://www.dot.il.gov/>. The list is found under Doing Business; Materials; Approved Lists for Materials. There is an Index which includes the contact person for questions about the list. A link has also been provided on the web page for an e-mail subscription to receive notice of changes to any list.

### 5.0 CERTIFICATION - INITIAL APPLICATION

- 5.1 A **Producer** may request certification to provide **Precast Concrete Products** by submitting the following documentation:
  1. A **Quality Control Plan** conforming to the minimum requirements in Attachment A.
- 5.2 All requests for certification will be conducted by the **District or Bureau** who has **Quality Assurance** responsibility for the **Producer**. The evaluation will consist of the following:
  1. Inspection and approval of the **Producer's Plant and Laboratory**.
  2. Evaluation and approval of the **Producer's** proposed **Quality Control Plan**.
  3. Evaluation and approval of the **Producer's** prior performance, when applicable.
  4. Sampling and testing of **Component Materials** by the **Department**. Acceptable test results are required for approval.
  5. The option to sample and test a minimum of three (3) units for each **Precast Concrete Product** to verify compliance with **Specifications**. Additional sampling and testing may be performed for each mix design, casting method,

and curing method used on a single product. Acceptable test results are required for approval.

For pipe, mandatory sampling and testing a minimum of three (3) different sizes is required. The same class of pipe shall not be used for all three sizes. At least one size of pipe shall be tested with a different class. A minimum of three (3) units per pipe size shall be tested. Acceptable test results are required for approval.

5.3 Any deficiencies will be documented in writing by the **District** or **Bureau** who has **Quality Assurance** responsibility for the **Producer**. Subsequent inspections will be performed by the responsible **District** or **Bureau**. The inspections will be scheduled upon written notice from the **Producer** that corrective action has been completed.

5.4 After the responsible **District** or **Bureau** has determined the approval or denial of the **Producer's** request for certification to provide **Precast Concrete Products**, the **Bureau** will notify the **Producer**.

## 6.0 CERTIFICATION – CONTINUED CERTIFICATION OF PRODUCER

Continued certification of a **Producer** to provide **Precast Concrete Products** will be determined by the **Department** based on:

1. Compliance with this Policy Memorandum, the approved **Quality Control Plan**, and **Specifications**.
2. Verification of the **Quality Control** program through **Quality Assurance** testing and inspection.

The **Department** reserves the right to immediately discontinue certification for frequent or gross lack of quality control by the **Producer**, as determined by the **Engineer**. The **Producer** will be removed from the “Approved List of Certified Precast Concrete Producers” until the **Engineer** is satisfied the **Producer** has taken sufficient corrective action.

## 7.0 CERTIFICATION - REVOCATION OF PRODUCER’S CERTIFICATION

7.1 The **Department** may revoke a **Producer's Certification** by removing the **Producer** from the “Approved List of Certified Precast Concrete Producers” for a stated period of time under any of the following circumstances:

1. Misrepresentation of materials or products.
2. Submittal of false records.
- 1.3. Failure to follow this Policy Memorandum.
- 2.4. Failure to follow the approved **Quality Control Plan**.
- 3.5. Failure to comply with the physical standards of the **Specifications**.
- 4.6. Performs work determined by the **Department** to be detrimental to the quality of the **Precast Concrete Product**.

- 7.2 A **Producer** under revoked certification status may not provide **Precast Concrete Products** to the **Department**.
- 7.3 The **Producer** may re-apply for certification status at the end of the revocation period. Re-application shall be in writing and include the specific steps taken to correct the cause for loss of certification.

## 8.0 DISPUTE RESOLUTION

The Regional Engineer and the Bureau Chief of Materials and Physical Research, or their designated representatives, shall mediate any dispute arising from the administration of this Policy Memorandum. If the resolution of the dispute is not satisfactory to the **Producer**, the **Producer** may submit a written appeal to the Director of Highways or his/her designee.

## 9.0 PRODUCERS' RESPONSIBILITIES - GENERAL

It is the **Producer's** responsibility to:

1. Make application for certification.
2. Designate a **Quality Control Manager**.
3. Provide personnel with minimum required training.
4. Prepare a **Quality Control Plan**.
5. Ship only **Precast Concrete Products** that have been manufactured according to this Policy Memorandum, the **Quality Control Plan**, and the **Specifications**.
6. Reimburse the **Department's** transportation, per diem (meals), lodging, and incidental travel costs for initial certification inspections, re-certification inspections, or **Quality Assurance** inspections. This is applicable only if the **Bureau** has **Quality Assurance** responsibility for the **Producer's Plant** and the trip from the **Bureau** to the **Plant**, the **Plant** inspection, and the return trip to the **Bureau** cannot be completed within one day's normal work hours of 8:00 AM to 4:30 PM.

## 10.0 PRODUCERS' RESPONSIBILITY - QUALITY CONTROL

**Quality Control** is the responsibility of the **Producer**, who shall:

1. Implement the **Quality Control Plan**, utilize sufficient personnel and backup for production **Quality Control**, and notify the **Engineer** of **Precast Concrete Product** production. In particular, production notification shall be provided to the **Engineer** for a start-up of a new product or the manufacture of a non-routine product.
2. Designate a **Quality Control Manager** who has direct responsibility for the **Quality Control** of all **Precast Concrete Products** produced under this Policy Memorandum. The **Quality Control Manager** shall report directly to the plant manager for all **Quality Control** issues. The duties of the **Quality Control Manager** are listed in Attachment B.
3. Monitor all **Component Material** stockpiles for compliance with the **Specifications** and any requirement for **Department** approval.
4. Monitor all production equipment and processes for compliance with the **Specifications**.
5. Record **Quality Control** test results.
6. Verify compliance with the physical standards of the **Specifications**.
7. Identify, repair, and document the repair of defects where allowed by the **Specifications**.
8. Reject **Precast Concrete Products** that do not comply with the **Specifications**.
9. Ship only **Precast Concrete Products** that have been produced according to this Policy Memorandum, the **Quality Control Plan**, and the **Specifications**.
10. Monitor shipping procedures such as loading, labeling, and record keeping.
11. Provide personnel, equipment, and handling for any sampling requested by the **Engineer**.
12. Perform **Quality Control** in a manner which includes the recognition of obvious defects and provides for their immediate correction. The **Quality Control** shall also include appropriate action when passing test results are near **Specification** limits. **Quality Control** may require increased testing, communication of test results, modification of operations, suspension of mixture production, rejection of material, or other actions as appropriate.

## 11.0 DEPARTMENT RESPONSIBILITIES - QUALITY ASSURANCE

The **District** or **Bureau** has primary responsibility for **Quality Assurance**, including the duty and responsibility to:

1. Verify the **Producer's Quality Control Plan** is being implemented.
2. Designate an **Inspector** who will administer the **Department's Quality Assurance** Program.
3. Observe the **Producer's Quality Control** activities.
4. Witness **Quality Control** testing or conduct **Quality Assurance** split sample testing a minimum of once a month for concrete strength. This may be for each **Precast Concrete Product** or may represent multiple **Precast Concrete Products**. In addition, the **District** or **Bureau** will witness a three-edge-bearing test once a month. The Department reserves the option to witness slump, air, absorption, permeability, hydrostatic, density, freeze/thaw, linear drying shrinkage, and abrasion resistance tests. The **District** or **Bureau** may reduce the **Quality Assurance** test frequency if production for the **Department** is minimal or sporadic over a period of time.

As determined by the **District** or **Bureau**, **Precast Concrete Products** will be checked for dimensions and dimensional tolerances. This will be performed at the **Producer's Plant**, or at a location determined by the **District** or **Bureau**.

5. Periodically sample and test all **Component Materials**. The minimum will be once per year, except for admixtures. Admixtures will be sampled and tested if quality is a concern.
6. Authorize or direct random sampling at the **Plant** or the jobsite.
7. Authorize third-party (Consultant) sampling or testing for **Quality Assurance**.
8. Increase the sampling frequency or randomly inspect the **Producer's Plant** and **Laboratory** at any time. As a minimum, an annual inspection of the **Plant** and **Laboratory** will be performed. The inspection will be performed by the **District** or **Bureau**, or the **District** and **Bureau**.

## 12.0 DEPARTMENT RESPONSIBILITIES - ACCEPTANCE OF PRODUCTS

- 12.1 The **Engineer** will accept only **Precast Concrete Products** that comply with the requirements of the **Specifications** and this Policy Memorandum.
- 12.2 The **Engineer** will visually inspect the **Precast Concrete Product** for workmanship and physical condition at any convenient location, such as **Plant** or jobsite.



### 13.0 DEPARTMENT RESPONSIBILITIES - REJECTION OF PRODUCTS

13.1 The **Engineer** may reject **Precast Concrete Products**:

1. Not manufactured according to this Policy Memorandum, the approved **Quality Control Plan**, or the **Specifications**.
2. Without proper identification markings.
3. With defects as defined in Sections 23.0 and 24.0.
4. Manufactured with misrepresented materials, such as using non-specification components or unapproved components.
- 1.5. When production or shipping records are false.

13.2 The Resident **Engineer** or Physical Test **Engineer** shall notify the responsible **District** or **Bureau** of any **Precast Concrete Products** rejected at the jobsite.

### 14.0 DEPARTMENT RESPONSIBILITIES - RECORD KEEPING

The **District** and/or **Bureau** will:

1. Maintain a diary or inspection form for each **Plant** which documents the date of the visit and the time frame. The diary or inspection form will include items inspected, any repairs observed, and any corrective action taken while present during the visit.
2. Maintain test results of samples taken during the **Plant** inspection visits.
3. Maintain test records of **Component Materials**.
4. Maintain a current list of **Producers** certified to provide **Precast Concrete Products**.
5. Retain the shipping ticket or bill of lading in the Resident **Engineer's** job file.
6. Prepare MISTIC reports that identify the **Producer** and quantities of **Precast Concrete Product** delivered.

### 15.0 QUALITY CONTROL PROGRAM - QUALITY CONTROL PLAN

Notice of **Quality Control Plan** Revision - The **Producer** shall immediately notify in writing of any changes to the approved **Quality Control Plan**. The revision(s) shall be submitted for approval to the **District** or **Bureau** who has **Quality Assurance** responsibility for the **Producer**. In January of each year, the **Producer** shall submit a revised **Quality Control Plan** to the responsible **District** or **Bureau** containing all approved addendums made in the previous 12 months. In the event no changes have been made in the previous 12 months, the **Producer** may simply declare in writing the **Quality Control Plan** to be

current and binding. The **District** shall forward a copy of all **Quality Control Plans**, addendums, and related documents to the **Bureau**. The **Bureau** will retain a copy of all expired **Quality Control Plans**, addendums, and related documents for a minimum period of three (3) years.

## **16.0 QUALITY CONTROL PROGRAM - FACILITIES**

- 16.1 **Plant** - Production facility buildings, beds, forms, and equipment used to manufacture products under this program shall comply with the applicable **Specifications**. Failure to maintain environmental or dimensional standards will be cause for corrective action by the **Producer**.
- 16.2 **Laboratory and Test Equipment** - The **Laboratory** shall have the facilities and equipment required by the **Specifications** for sampling and testing **Precast Concrete Products**. Attachment C lists the minimum required test equipment for precast concrete plant operations. Calibration of test equipment shall be performed and documented according to the applicable **Test Procedure**. Slump, air meter (Type A, Type B, or Volumetric), unit weight, cylinder molds (plastic), steel extrusion controllers and neoprene caps (pads), and capping cylindrical strength specimens shall be documented on the **Department's** "Calibration of Field and Plant Equipment" form, which is referenced in the "Manual of Test Procedures for Materials".
- 16.3 **Publications and Similar Documents** - The **Producer** shall maintain on-site, a current copy of **Specifications** and **Test Procedures** that apply to the manufactured **Precast Concrete Products**.

## **17.0 QUALITY CONTROL PROGRAM - PERSONNEL/TRAINING**

- 17.1 The **Producer** shall employ qualified **Quality Control** personnel to perform all specified **Test Procedures**.
- 17.2 For testing wet and dry cast products, the **Quality Control Manager** and **Technician** shall have successfully completed the American Concrete Institute (ACI) Certification Program for Concrete Field Testing Technician - Grade I. A **Concrete Tester** may provide assistance with testing as explained under "Definitions." The **Quality Control Manager** shall be an employee of the **Producer**. Consultant personnel may be used for all remaining personnel, provided they have completed the required training.
- 17.3 Consultant personnel may be used as backup when required in the **Quality Control Plan**, provided they have completed the required training.

## **18.0 QUALITY CONTROL PROGRAM - MATERIALS**

- 18.1 **General** - The **Producer** shall use only materials (cement, finely divided materials, aggregates, water, reinforcement steel, and admixtures) that meet the applicable **Specifications**. The sources of all **Component Materials** will be approved by the **Department**, and the Aggregate Gradation Control System (AGCS) Policy Memorandum will apply to all aggregate.

An exception will be granted for the AGCS program if the **Producer** is the responsibility of the **Bureau**. However, an exception will not be given for the aggregate quality requirement. To obtain an AGCS exception, the **Producer** shall indicate that their aggregate source is not in Illinois and does not participate

in the AGCS program. The exception will be allowed if the **Producer** can meet the requirements of Option A or B.

Option A Requirements (**Producer** is **Bureau** responsibility):

1. For each aggregate source, the gradation number(s) used by the **Producer** shall be tested for washed gradation according to AASHTO T 11 and T 27. The minimum frequency shall be twice each month, at uniform intervals. The acceptable gradation bands of the aggregate shall be established by the **Producer**, and this information shall be provided to the **Department**. Approval of the coarse aggregate gradation bands will be given if the critical sieve, as determined by the **Engineer**, does not exceed  $\pm 8$  percent. Approval of the fine aggregate gradation bands will be given by the **Engineer** if no sieve exceeds  $\pm 20$  percent.
2. The washed aggregate gradation testing may be done by the **Producer**, a consultant hired by the **Producer**, a ready mixed concrete producer (if supplying concrete to the **Producer**), or by the aggregate source. The required aggregate laboratory equipment shall be according to the **Department's** "Aggregate Laboratory Equipment" document. Refer to Attachment D. The laboratory will be inspected by the **Bureau**.
3. The individual performing the test shall have obtained **Department** training either as an Aggregate Technician or Mixture Aggregate Technician. Course information is available on the Internet at <http://www.lakeland.cc.il.us/idotqcqa/>.

Option B Requirements (**Producer** is **Bureau** responsibility):

1. The **Department's** AGCS program may be substituted with another State agency's aggregate gradation control system program, if determined to be comparable to the **Department's** program. At this time, Indiana's Certified Aggregate Program (CAP) and Michigan's Prequalified Supplier Program for Aggregates are considered to be comparable to the **Department's** program.

18.2 Cement, Finely Divided Minerals, Aggregates, Reinforcement Steel, and Admixtures - The **Producer** shall maintain documentation (delivery tickets, invoices, etc.) from an approved source.

18.3 Miscellaneous Components - All **Miscellaneous Components** furnished by the **Producer** shall comply with the applicable specification. The **Producer** shall maintain copies of manufacturer's certifications of quality and performance for gaskets, mastic, castings, and any other material supplied to projects.

## 19.0 QUALITY CONTROL PROGRAM - MANUFACTURING CONTROL

19.1 Quality Control - Under the supervision of the **Quality Control Manager**, the **Producer** shall monitor production for compliance with the **Specifications** and the **Quality Control Plan**.

19.2 Shop Drawings - The **Quality Control Manager** shall ensure that the product is manufactured according to **Specifications**, which may include shop drawings approved by the **Engineer**. If shop drawings require the approval of the **Engineer**, production shall not begin until approval has been obtained. Shop drawings, whether or not they require the **Engineer's** approval, shall be available at the **Plant** for inspection by the **Engineer**.

- 19.3 Mix Design - The **Quality Control Manager** shall ensure that all mix designs are approved by the **Engineer** and shall notify the **Engineer** if a mix design or **Component Material** is changed.
- 19.4 Identification Markings - The **Producer** shall apply identification marks immediately after forms are removed or after curing is completed. The marks shall be etched/indented into the concrete, or painted/inked with waterproof marking according to Attachment E.

## 20.0 QUALITY CONTROL PROGRAM - CURING AND SHIPPING

The **Quality Control Manager** shall monitor and document compliance with the curing methods, curing periods, and holding periods for each **Precast Concrete Product**. The **Quality Control Manager** or authorized employee of the **Producer** shall make final inspection of the **Precast Concrete Product** just prior to and after loading when shipping to the jobsite. This would apply to product manufactured by the **Producer** or another **Producer**.

## 21.0 QUALITY CONTROL PROGRAM - PRODUCT STORAGE

The **Producer** shall provide adequate and accessible storage for finished **Precast Concrete Products** awaiting inspection and/or shipment. The storage area shall be free of vegetation. **Precast Concrete Products** shall not be stored directly on dirt or mud.

## 22.0 QUALITY CONTROL PROGRAM – MINIMUM QUALITY CONTROL SAMPLING AND TESTING

- 22.1 The **Producer** or designated consultant shall perform **Quality Control** sampling and testing. When cylinders are used for compressive strength, the strength shall be determined from the average of at least two cylinder breaks. When cores are used, the strength may be determined from a single core.
- 22.2 The minimum required sampling and testing shall be according to Attachment F. With the approval of the **Engineer**, a single slump or air content test may represent multiple **Precast Concrete Products** provided the same mix design is used for the various products. With the approval of the **Engineer**, a single concrete compressive strength (two cylinders) may represent multiple **Precast Concrete Products** provided the same mix design and curing method (for product and cylinders) is used. With the approval of the **Engineer**, a single concrete compressive strength (one core) or three-edge-bearing test may represent multiple **Precast Concrete Products** provided the same mix design, casting method, and curing method are used.
- If the minimum required sampling and testing is not specified for a **Precast Concrete Product**, the **Bureau** shall be contacted to amend Attachment F. In the interim, the **Producer** shall propose the sampling and testing in the **Quality Control Plan** for approval by the **Engineer**.
- 22.3 Three-Edge-Bearing Test - Each **Producer** of pipe shall have the option of performing strength testing with cylinders, cores, or according to AASHTO T 280 (three-edge-bearing test) on pipe  $\geq 1050$  mm (42 in.). Small diameter pipe

(<1050 mm (42")) shall be tested for strength according to AASHTO T 280 (three-edge-bearing test).

Concrete drain tile shall be tested for strength according to AASHTO T 280 (three-edge-bearing test). The minimum crushing strength (ultimate load) shall be 20.5 kN/ lin. m (1,400 lb./ lin. ft) according to Article 1040.06.

When testing a **Precast Concrete Product** with the three-edge-bearing test, record the load which produces a 0.25 mm (0.01 inch) crack, and also the ultimate failure load. The product shall not be used on a project. If the load reaches 110 percent of the design 0.25 mm (0.01 inch) crack load without cracking, the testing may be stopped and testing to ultimate load is not required. The product may be used on a project.

- 22.4 The concrete strength test of record shall be according to the **Specifications**, which in many cases is a 28 day test. A strength test performed prior to the test of record may be used if approved by the **Engineer**. For cylinders, make additional test specimens for early strength testing, but two (2) specimens are to be reserved for the 28 day test unless otherwise approved by the **Engineer**. An excessive number of test failures, as determined by the **Engineer**, will be cause to prohibit strength testing prior to the test of record.
- 22.5 Tests performed by the **Producer** to satisfy the requirements of in state or out-of-state agencies are acceptable for meeting test frequency requirements.
- 22.6 Pipe products that fail a test for a specific class may not be used for the class that the test data meets, unless identification markings are corrected to the satisfaction of the **Engineer**. Documentation by the **Engineer** shall accompany shipments to a project.
- 22.7 A **Precast Concrete Product** shall be rejected if it fails **Specification** test requirements. A sample of any item, class, or size that fails may be rechecked with two additional samples from that item, class, and size, provided they are from the same lot. The **Engineer** will define the lot, which normally will be by concrete batch or day of production. Both samples shall meet **Specifications** for the lot to be accepted.

## 23.0 QUALITY CONTROL PROGRAM - VISUAL INSPECTION

The **Producer** is responsible for the visual inspection of all **Precast Concrete Products** before shipping. The minimum guidelines are specified below. Photographs of precast concrete products that should be rejected, accepted, or rejected due to unacceptable repairs can be found on the Internet at <http://www.dot.il.gov/materials/precastconcretephotos.pdf>.

1. PHYSICAL MEASUREMENTS - The product shall be rejected if it does not meet dimensions or dimensional tolerances of the **Specification**.

In regards to overpacking and featheredge, this is excess material present in the bell end of the product. This is caused by mix packed past the end of the barrel during production. The product shall be rejected unless dimensional tolerances are satisfied. If delamination occurs, the product shall be rejected.

2. CRACKS - The product shall be rejected if a crack passes through the wall of the product. A single end crack that does not extend into the wall of a product is not a cause for rejection. The product shall be rejected if it has a surface

crack width of 0.25 mm (0.01 in.) or greater and exceeds 0.3 m (12 in.) in length, regardless of position in the wall.

3. HONEYCOMB - If it is deeper than 3/4 the depth of the coarse aggregate and exceeds 5 percent of the surface area of the product, it shall be rejected. All other honeycomb may be repaired when approved by the **Engineer** in writing. Pipe with honeycomb on the inside shall be rejected.
4. SMOOTHNESS of the barrel - The inside of a pipe or box culvert shall be rejected if it is not substantially free from surface roughness.
5. IMPROPER REINFORCEMENT PLACEMENT - A thin layer of concrete over the steel may be detected by shadowing. Further inspection may be necessary to determine the proper depth of cover as stated in the appropriate **Specification**. Product shall be rejected if it has improper concrete cover over the reinforcement. The exposed ends of longitudinal steel, stirrups, lift holes, or spacers used to position the reinforcement (cage) during concrete placement is not cause for rejection. Any other exposed steel is considered a defect and the product shall be rejected.
6. CHIPPED OR DAMAGED ENDS - The product shall be rejected if the damage is halfway or more into the joint and has a length of more than 10 percent of the end circumference or perimeter.
- 1.7. IDENTIFICATION MARKINGS - The product shall be rejected if the identification markings are not legible or are absent.
- 2.8. OTHER DEFECTS - The product shall be rejected if the repair size exceeds 2 percent of the cross-sectional area and 1/2 percent of the surface area of the product.

## 24.0 QUALITY CONTROL PROGRAM - REPAIRS

The **Producer** may repair a **Precast Concrete Product** unless rejection is required per section 23.0. However, the **Engineer** may not accept a repaired **Precast Concrete Product** if it will not perform as intended, the frequency of repairs is excessive, or the workmanship of the repair is poor. The **Producer** shall follow the guidelines below and the **Quality Control Plan** when doing a repair.

1. CRACKS which do not exceed the cause for rejection do not have to be repaired, unless required by the **Precast Concrete Product** AASHTO/ASTM standard specification or specified in the contract documents.
2. HONEYCOMB; CHIPPED OR DAMAGED ENDS; OTHER DEFECTS which do not exceed the cause for rejection - Remove all loose material, cutting the area back until the coarse aggregate will break under chipping rather than dislodging. The sides of the area to be repaired shall be shaped with one or more faces having a minimum depth of 13 mm (1/2 inch) as perpendicular as possible to the surface of the area. Clean area by brushing. Exposed reinforcement steel shall be cleaned of foreign substances and detrimental corrosion. The repair shall be according to Item 4 or 5.
3. HOLES - Core holes obtained for strength testing shall be repaired according to Item 4 or 5.

4. REPAIR MATERIALS - The prepared surface and up to 100 mm (4 inches) outside the repair area shall be wetted a minimum of one hour before application of the repaired material. The surface shall be maintained in a dampened condition during that period. Immediately before placing the repair material, any excess water shall be removed. The repair material shall be a no-slump concrete mix using the product's component materials which can be packed solidly into the defective area by hand or under vibration. The patch material shall be cured for three (3) days according to Article 1020.13 (a) (3), and shall obtain a strength equivalent to the specified strength for the existing **Precast Concrete Product**.
5. PREPACKAGED REPAIR MATERIALS - Prepackaged repair materials may be used, provided the resulting appearance is not objectionable to the **Engineer**. The prepared surface and up to 100 mm (4 inches) outside the repair area shall be wetted a minimum of one hour before application of the prepackaged repair material. The surface shall be maintained in a dampened condition during that period. Immediately before placing the prepackaged repair material, any excess water shall be removed. The prepackaged repair material shall be a no-slump mix which can be packed solidly into the defective area by hand or under vibration. Aggregates may be used according to the manufacturer's recommendations. Curing shall be according to the manufacturer's recommendations. The prepackaged repair material shall be from the "Approved List of Non-Shrink Grouts", the "Approved List of Packaged, Dry, Rapid Hardening Cementitious Materials for Concrete Repairs", or the "Approved List of Polymer Modified Portland Cement Mortar." The prepackaged material shall be appropriate for the type of repair.

## 25.0 PRODUCT SHIPPING DOCUMENTATION

- 25.1 Shipment Reporting - The **Producer** shall report shipments weekly or as requested by the **District** or **Bureau**. The shipment report shall be submitted to the **District** or **Bureau** responsible for **Quality Assurance** and shall include **Precast Concrete Products** shipped to all **Districts**. The report shall detail all shipments to projects such as contract number, quantity, size, class, and other information as requested by the **District** or **Bureau**. If the product was manufactured by another **Producer**, indicate this in the shipping report or by other arrangements with the **District** or **Bureau**. Miscellaneous Components shall also be indicated in the shipping report or by other arrangements with the **District** or **Bureau**.
- 25.2 Shipment Copies - A copy of the shipping ticket or bill of lading which identifies the material and quantities shall accompany each shipment to the jobsite and be retained in the Resident **Engineer's** file.
- 25.3 Shop Drawings - If requested or required, a copy of the shop drawings shall be provided to the **District** office who received the **Precast Concrete Product**. The shop drawings are for the **District's** as-built records.

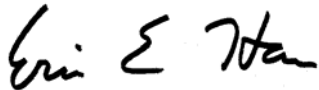
## 26.0 RECORD KEEPING

- 26.1 Diary - The **Quality Control Manager** shall maintain a diary of all activities related to **Precast Concrete Product** sampling, testing, repairs, and corrective actions. The **Producer** shall retain diary records for a minimum period of three (3) years.

- 26.2        Tests - The **Producer** shall retain **Quality Control** test records for a minimum period of three (3) years.
- 26.3        Invoices - The **Producer** shall retain copies of purchase orders and/or invoices for all **Component Materials** and **Miscellaneous Components** for a minimum period of two (2) years.

## 27.0    **SELF-CONSOLIDATING CONCRETE**

Refer to Attachment G for information on the use of self-consolidating concrete. If desired, the **Producer** may combine the **Quality Control Plan** addendum in Attachment G with the **Quality Control Plan** in Attachment A.



Eric E. Harm, P.E.  
Engineer of Materials  
and Physical Research

DAD/kkt

This policy memorandum supersedes Policy Memorandum 02-02 dated March 1, 2002.
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## ILLINOIS DEPARTMENT OF TRANSPORTATION

## MODEL QUALITY CONTROL PLAN FOR PRECAST CONCRETE PRODUCTS

Effective: January 1, 2005

**INSTRUCTIONS:** The Producer shall respond to all items addressed in this model. This is applicable to work performed by the Producer or work subcontracted. Examples are provided to assist the Producer, and any innovations to the quality control process may be presented. If an item does not pertain to the Producer's particular operation, it shall be marked "Not Applicable" or "N/A."

QUALITY CONTROL PLAN  
PRECAST CONCRETE

Producer: \_\_\_\_\_

P.O. Box: \_\_\_\_\_

Street Address: \_\_\_\_\_

City/State/Zip Code: \_\_\_\_\_

Phone No.: \_\_\_\_\_

Fax No.: \_\_\_\_\_

Name of Plant or No.: \_\_\_\_\_

PRODUCER RESPONSIBILITIES

This Quality Control plan explains how \_\_\_\_\_ (Insert name of firm/corporation) proposes to control the equipment, materials, and production methods to ensure the specified product is obtained.

The Producer agrees to read, understand, abide, and implement all the requirements in the Department's Policy Memorandum (insert number), "Quality Control/Quality Assurance Program for Precast Concrete Products", and the Policy Memorandum will be considered a part of this Quality Control Plan.

PRODUCER'S ACKNOWLEDGEMENT

(Insert name of firm/corporation) desires to obtain advance approval of materials to be supplied to Department of Transportation contractors as more fully described herein. I and the company understand that the Department of Transportation reserves the right in its contracts to approve materials at the source of supply as provided in Article 106.01 of the Standard Specifications for Road and Bridge Construction. I and the company further understand that approval of company supplied material pursuant to this request does not constitute a contract to supply material to the State of Illinois or any of its contractors, and that the Department of Transportation does not assure or guarantee that any materials approved hereunder will be supplied to the State or any of its contractors. In consideration of approval, I and the company agree to the terms, conditions, and performance standards of the Standard Specifications for Road and Bridge Construction and Policy Memorandum (insert number), "Quality Control/Quality Assurance Program for Precast Concrete Products," a copy of which has been received.

I. PRODUCER PRODUCTS OR PRODUCT LINES

INSTRUCTIONS: List products or product lines to be manufactured. Include references to the Standard Specifications for Road and Bridge Construction, Highway Standards, and applicable Special Provisions.

Example:

Reinforced Concrete Pipe - Article 1040.03

Reinforced Concrete Pipe Elbow - Article 542.08 and Highway Standard 542601

Reinforced Concrete Pipe Tee - Article 542.08 and Highway Standard 542606

Segmental Concrete Block Wall - Special Provision

II. SHOP DRAWINGS

INSTRUCTIONS: The wording for shop drawings is provided for the Producer as indicated below.

Shop drawings will be according to the Standard Specifications for Road and Bridge Construction (Adopted January 1, 2002) and other documents as issued by the Department.

III. CONCRETE PLANT AND DELIVERY TRUCKS

INSTRUCTIONS: Provide the following information if concrete is provided by a ready-mix plant.

Concrete Plant Name: \_\_\_\_\_

Concrete Plant Location: \_\_\_\_\_

Concrete Producer No.: \_\_\_\_\_

INSTRUCTIONS: Provide the following information if concrete is mixed at the Producer's precast plant facility.

Plant Equipment Manufacturer: \_\_\_\_\_

Plant Capacity: \_\_\_\_\_

List of Delivery Trucks and Their Capacity: \_\_\_\_\_

List Other Delivery Methods: \_\_\_\_\_

NOTE: The plant and delivery trucks are to be approved according to Article 1020.11(a) of the Standard Specifications for Road and Bridge Construction (Adopted January 1, 2002).

IV. PRODUCER QUALITY CONTROL LABORATORY

Location: \_\_\_\_\_

Contact Person: \_\_\_\_\_

Telephone No.: \_\_\_\_\_

Fax No.: \_\_\_\_\_

The quality control laboratory is \_\_\_\_\_ sq. ft.

The laboratory was approved on \_\_\_\_\_ by District \_\_\_\_\_.

In the event of lab equipment failure, \_\_\_\_\_ will provide back up equipment.

V. PRODUCER QUALITY CONTROL PERSONNEL

Individual's Name: \_\_\_\_\_

American Concrete Institute (ACI) Training: \_\_\_\_\_

Company Name: \_\_\_\_\_

Telephone Number: \_\_\_\_\_

\_\_\_\_\_ is the ACI Concrete Field Testing Technician – Grade I who will be responsible for mixture control and adjustments when product is manufactured. \_\_\_\_\_ is the backup ACI Concrete Field Testing Technician – Grade I.

\_\_\_\_\_ is the Quality Control Manager who will be responsible for overall product quality control. \_\_\_\_\_ is the backup Quality Control Manager.

\_\_\_\_\_ is the Plant Manager.

\_\_\_\_\_ is the individual who will make final inspection of product just prior to loading and shipping.

VI. MIX DESIGNS

INSTRUCTIONS: For new mix designs, provide all information requested according to Article 1020.05 of the Standard Specifications for Road and Bridge Construction (Adopted January 1, 2002). The Producer shall include the following: the date, fine aggregate Type (optional), source of all materials, gradation of fine and coarse aggregates, coarse aggregate voids (optional), specific gravities (provided by Department's District office), material proportions (batch mass or weights), water/cement ratio, mortar factor (optional), type and proposed dosage of admixtures, target slump, target air content, and mix design strength for the new mix design.

Otherwise state: "Only mix designs previously verified by the Department will be used."

VII. PRODUCER SAMPLING AND TESTING

INSTRUCTIONS: If the Producer will use a test frequency higher than that specified in Attachment F, indicate this higher test frequency for the precast concrete product. If the minimum required sampling and testing is not specified for a precast concrete product, indicate the sampling and testing that will be used.

INSTRUCTIONS: When cylinders are used for compressive strength testing, indicate how the specimens will be cured and the location for compression strength testing.

Example:

Plastic cylinder molds [152 by 305 mm (6 by 12 in.)] will be used to cast strength specimens. The plastic cylinder mold will be covered with a plastic cylinder lid. Testing will be performed at the manufacturing plant.

INSTRUCTIONS: The concrete strength test of record shall be according to specifications, which in many cases is a 28 day test. A day earlier than the requirement may be submitted by the Producer for a precast concrete product.

Example:

For precast box culvert, compressive strength testing will be performed at 28 days. Additional cylinders will be made if testing at an earlier age is desired.

INSTRUCTIONS: For concrete pavers according to ASTM C 936, the Producer shall provide ASTM C 67 freeze/thaw test results which indicate the concrete paver has adequate resistance to freeze/thaw. For precast block or articulated block revetment mat, the Producer shall provide ASTM C 67 freeze/thaw test results or ASTM C 1262 freeze/thaw test results which indicate the precast concrete block has adequate resistance for freeze/thaw.

VIII. FAILING TESTS AND DEFECTIVE WORK

INSTRUCTIONS: Indicate the communication procedures between the Producer, the Concrete Producer, the Consultant, and Department personnel in the event of failing tests or observation of defective work. This may also be in flow chart form.

Example:

In the event of failing tests or observation of defective work at the precast plant, the ACI Concrete Field Testing Technician - Grade I will be responsible for notifying the Quality Control Manager. The Quality Control Manager will be responsible for notifying the Department's Inspector.

IX. AGGREGATE MATERIALS

INSTRUCTIONS: The wording for "A) Aggregates" and "D) Maintaining Aggregate Quality at the Plant" is provided for the Producer. Indicate the material sources for "B) Coarse Aggregates" and "C) Fine Aggregates". If applicable, attach proposed mix plant gradation bands in accordance with the Department's "Development of Gradation Bands on Incoming Aggregate at Mix Plants."

## A) Aggregates

1. Aggregate Gradation Control System (AGCS) Program – Aggregate Source is Participant

Certified aggregate gradation bands (including master band, if required) will be obtained from the aggregate source for all certified aggregates, prior to any shipment of material to the plant.

2. Aggregate Gradation Control System (AGCS) Program – Aggregate Source is Non-Participant

NOTE: Item 2 is permitted only when the Bureau of Materials and Physical Research has quality assurance responsibility for the Producer, and the Aggregate Source is not in Illinois.

For \_\_\_\_\_ (indicate Aggregate Source), gradation number(s) \_\_\_\_\_ will be tested for washed gradation according to

AASHTO T 11 and T 27. The minimum frequency will be twice each month, at uniform intervals. The acceptable gradation band for gradation number(s) \_\_\_\_\_ will be \_\_\_\_\_.

The washed aggregate gradation testing will be done by \_\_\_\_\_ (indicate Producer or Consultant hired by Producer or Aggregate Source). The quality control laboratory information is as follows:

Location: \_\_\_\_\_

Contact Person: \_\_\_\_\_

Telephone Number: \_\_\_\_\_

The quality control laboratory is \_\_\_\_\_ sq. ft..

The laboratory was approved on \_\_\_\_\_ by BMPR.

In the event of lab equipment failure, \_\_\_\_\_ will provide back up equipment.

The training information for the individual who will perform the gradation testing is as follows:

Individual's Name: \_\_\_\_\_

Training (Aggregate Technician or Mixture Aggregate Technician): \_\_\_\_\_

Company Name: \_\_\_\_\_

Telephone Number: \_\_\_\_\_

3. Aggregate Gradation Control System (AGCS) Program – Aggregate Source Participates in Comparable Program

NOTE: Item 3 is permitted only when the Bureau of Materials and Physical Research has quality assurance responsibility for the Producer, and the Aggregate Source is not in Illinois.

\_\_\_\_\_ (Aggregate Source) participates in the \_\_\_\_\_ (Indiana Certified Aggregate Program (CAP) or Michigan Prequalified Supplier Program for Aggregates) for gradation number(s) \_\_\_\_\_.

B) Coarse Aggregates

Material: \_\_\_\_\_ (Example: CA 11 - Crushed Stone)

Department Producer/Supplier Number: \_\_\_\_\_

Company Name: \_\_\_\_\_

Company Address: \_\_\_\_\_

Contact Person: \_\_\_\_\_

Telephone Number: \_\_\_\_\_

## C) Fine Aggregates

Material: (Example: FA 01 - Natural Sand)

Department Producer/Supplier Number: \_\_\_\_\_

Company Name: \_\_\_\_\_

Company Address: \_\_\_\_\_

Contact Person: \_\_\_\_\_

Telephone Number: \_\_\_\_\_

## D) Maintaining Aggregate Quality at the Plant

Aggregates shall be stockpiled and handled in a manner which minimizes segregation and degradation, prevents contamination, and produces a uniform gradation, before placement in the plant bins.

Aggregates which are dumped directly into plant bins from delivery trucks will have a uniform gradation.

Aggregate which does not meet gradation requirements included herein or Department specifications for quality, will not be used for Department projects. Product manufactured with non-compliant aggregate material will not be supplied to Department projects.

X. CEMENT AND FINELY DIVIDED MINERALS

INSTRUCTIONS: The wording is provided for the Producer as indicated below. A producer/supplier of cement or finely divided minerals who is not on the approved list shall make arrangements with the Department for lot testing.

Cement will be from the "Approved List of Qualified Cement Plants" and finely divided minerals will be from the "Approved List of Suppliers for Finely Divided Minerals."

XI. WET CAST ADMIXTURES

INSTRUCTIONS: The wording is provided for the Producer as indicated below.

The wet cast admixtures will be obtained from the "Approved List of Concrete Admixtures."

XII. DRY CAST ADMIXTURES

INSTRUCTIONS: Indicate the material source for each dry cast admixture used in the manufacture of product. The Department does not maintain an approved list of dry cast admixtures.

Brand Name: \_\_\_\_\_

Company Name: \_\_\_\_\_

Company Address: \_\_\_\_\_

Contact Person: \_\_\_\_\_

Telephone Number: \_\_\_\_\_

### XIII. REINFORCING BAR AND WELDED WIRE REINFORCEMENT FABRIC

INSTRUCTIONS: The wording is provided for the Producer as indicated below.

Reinforcing bar will be from the “Approved List of Reinforcing Bar and/or Dowel Bar Producers,” and welded wire reinforcement fabric will be from the “Approved List of Welded Wire Reinforcement Fabric Producers.” Cold drawn wire will be obtained from approved sources sampled and tested by the Department.

All steel products will be domestic as specified in Article 106.01 of the Standard Specifications for Road and Bridge Construction (Adopted January 1, 2002).

### XIV. MISCELLANEOUS MATERIALS

INSTRUCTIONS: The wording is provided for the Producer as indicated below.

Any miscellaneous material used in the manufacture of a product or product lines, or any miscellaneous material supplied to Department projects will comply with applicable Department material specifications.

### XV. PRE-PRODUCTION, PRODUCTION, AND POST-PRODUCTION INSPECTION

INSTRUCTIONS: Indicate any additional pre-production, production, and post-production inspection procedures to those specified in the Department’s Policy Memorandum, “Quality Control/Quality Assurance Program for Precast Concrete Products.”

### XVI. IDENTIFICATION MARKINGS

INSTRUCTIONS: Indicate if identification markings will be etched into the concrete or painted/inked with waterproof marking for pipe, box culvert, drainage structures, bridge beams, and bridge three sided structure and temporary concrete barrier.

Example:

For pipe (which includes pipe elbows and pipe tees) identification markings will be etched into the concrete.

### XVII. CURING OF PRODUCT

INSTRUCTIONS: Indicate the curing method and period to be used for each precast concrete product.

Note: When a precast concrete product has attained the specified strength, the earliest the product may be loaded, shipped, and used is on the fifth calendar day. The first calendar day shall be the date casting was completed.

Example:

Pipe (which includes pipe elbows and pipe tees) will be steam cured until the next day after casting.

Segmental concrete block wall (retaining wall block) will be cured in a moist room for 24 hours.

XVIII SHIPPING

INSTRUCTIONS: Indicate the individuals who will make final inspection of the Precast Concrete Product just prior to and after loading when shipping to the jobsite. This would apply to product manufactured by the Producer or another Producer.

XVIV REPAIR PROCEDURES

INSTRUCTIONS: Indicate if a no-slump concrete mix or prepackaged material will be used for repairs. Indicate any additional repair procedures to those specified in the Department's Policy Memorandum, "Quality Control/Quality Assurance Program for Precast Concrete Products."

Example:

An approved prepackaged non-shrink grout will be used. No additional repair procedures will be used.



**INSTRUCTIONS:**

Return with Quality Control Plan or any amended Quality Control Plan.

To be completed by Producer.

**QUALITY CONTROL PLAN SIGNATURE SHEET****(IF AN INDIVIDUAL)**

Firm Name \_\_\_\_\_

Signature of Owner \_\_\_\_\_

Business Address: \_\_\_\_\_

P.O. Box: \_\_\_\_\_

Street Address: \_\_\_\_\_

City/State/Zip Code: \_\_\_\_\_

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**(IF A CO-PARTNERSHIP)**

Firm Name \_\_\_\_\_

Signature of Partner \_\_\_\_\_

Business Address: \_\_\_\_\_

P.O. Box: \_\_\_\_\_

Street Address: \_\_\_\_\_

City/State/Zip Code: \_\_\_\_\_

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**(IF A CORPORATION)**

Corporate Name \_\_\_\_\_

Signature of Corporate Officer \_\_\_\_\_

Business Address: \_\_\_\_\_

P.O. Box: \_\_\_\_\_

Street Address: \_\_\_\_\_

City/State/Zip Code: \_\_\_\_\_

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## DUTIES OF THE QUALITY CONTROL MANAGER<sup>1</sup>

- Duties of the **Quality Control Manager** shall include, but not be limited to the following:
- Supervise **Technicians** and **Concrete Testers**.
- Prepare and submit to the **District/Bureau** a **Quality Control Plan** that meets the minimum requirements of the **Department**.
- Notify the **Engineer** or **Inspector** of **Precast Concrete Product** production.
- Read and understand all **Specifications** related to the products manufactured at the Plant.
- Maintain a **Laboratory** that meets the requirements of the **Department**.
- Maintain and calibrate test equipment as required by the applicable test methods.
- Inspect and verify the accuracy of dimensions and condition of forms.
- Verify procedures for batching, mixing, placing, consolidating, curing, and finishing concrete.
- Verify procedures for concrete repair, handling, storing, and loading of finished products.
- Verify the proper fabrication and placement of reinforcement.
- Insure concrete mixture meets the requirements of the **Quality Control Plan**.
- Take quality control test samples and perform all testing required by the applicable **Specifications** and the **Quality Control Plan**.
- Inspect finished products for conformance with the shop drawing and/or applicable **Specifications**.
- Reject **Precast Concrete Products** that do not comply with the specifications.
- Submit recommendations to **District/Bureau Inspectors** for repairs to concrete products that do not conform to the **Specifications**.
- Prepare and maintain complete quality control records.

Note 1. These duties shall be performed by the **Quality Control Manager** or may be assigned to a **Technician** or **Concrete Tester**.

**MINIMUM REQUIRED TEST EQUIPMENT  
FOR PRECAST CONCRETE PLANT OPERATIONS**

**I. Dry Cast**

1. Slump equipment according to Illinois Modified AASHTO T119 and ruler. (Optional)
2. Thermometer according to Illinois Modified ASTM C1064.
3. Cylinder molds 152 X 305 mm (6 X 12 in.), according to Illinois Modified AASHTO M 205.
4. Tamping rod 16 X 584 mm (5/8 X 23 in.), according to Illinois Modified AASHTO T 23 for molding cylinders.
5. Mallet weighing  $0.57 \pm 0.23$  kg ( $1.25 \pm 0.50$  lb.), according to Illinois Modified AASHTO T 23 for molding cylinders.
6. Compression test machine for testing cylinders or cores according to Illinois Modified AASHTO T 22.
7. Compression test machine for testing concrete masonry units according to ASTM C140. This is applicable to block/brick only.
8. Three-edge-bearing machine according to AASHTO T280. This is applicable to pipe only.
9. Tools including wheelbarrow, shovel, hand scoop or trowel, and vibrator (if required for cylinder molds). These tools are needed for the slump test, air content test, and for molding cylinders.

**II. Wet Cast**

All of the equipment required for the dry cast operation above, in addition to the following:

1. Slump equipment according to Illinois Modified AASHTO T 119.
2. Air meter equipment according to Illinois Modified AASHTO T 152 or Illinois Modified AASHTO T 196.

## Illinois Department of Transportation

**Aggregate Laboratory Equipment**

Effective Date: October 1, 1995

Revised: January 1, 2002

[Note: For clarity, revision marks are not included in this 2002 revision. Substantive changes are noted in **BOLD**.]

**All equipment listed is required unless noted otherwise. This list recommends 12" full height sieves and 12" shakers. Individual needs may vary for the specific products. Eight-inch sieves and other alternate equipment may be substituted provided they conform to AASHTO requirements and are approved by the Engineer.**

Quantity	Description
1	Mechanical Sieve Shaker - 12" sieve capacity
1	Coarse Aggregate Sample Splitter Model SP-1 (AASHTO T-248, Method A)
4	Splitter pans, for coarse aggregate
1	Fine Aggregate Sample Splitter (Optional if AASHTO T248, Method B, quartering, is used)
4	Splitter pans, for fine aggregate
1	Sink and clear Water Supply
1	Oven, electric drying, capable of maintaining a uniform temperature of $110 \pm 5^{\circ} \text{C}$ ( $230 \pm 9^{\circ} \text{F}$ ) Optional – see Hot Plate
2	Hot plate, electric, or Burner, gas – in lieu of oven if approved by the Engineer.
1	Gloves, pair, insulated
1	Balance, electronic, 8,000-gram capacity, 0.1-gram readability
1	Balance Verification Weight, 5,000-gram, or <b>alternate comparable weight with mass clearly marked</b>
10	Pans, drying, typical rectangular (13" x 9" x 2") or typical round (14") minimum diameter
5	Pans, holding, typical round - 12" minimum diameter
2	Spoon, stainless steel, 15" minimum
1	Brush, stencil
1	Brush, brass
1	Knife, putty
2	Thermometers, - 18 to $150^{\circ} \text{C}$ (0 to $300^{\circ} \text{F}$ ), readable to $0.5^{\circ} \text{C}$ ( $1.0^{\circ} \text{F}$ ) to verify oven Temperature.
1	Set (11) Fine Aggregate Sieves, brass, 12" diameter, with brass or stainless cloth, -- 9.5 mm, 4.75 mm, 2.36 mm, 2.00 mm, 1.18 mm, 600 $\mu\text{m}$ , 425 $\mu\text{m}$ , 300 $\mu\text{m}$ , 180 $\mu\text{m}$ , 150 $\mu\text{m}$ , 75 $\mu\text{m}$ (3/8", #s 4, 8, 10, 16, 30, 40, 50, 80, 100, 200) AASHTO M92
1	Lid for 12" sieve
1	Pan, catch, bottom, 12"

## Illinois Department of Transportation

**Aggregate Laboratory Equipment**

(continued)

Effective Date: October 1, 1995

Revised: January 1, 2002

Quantity	Description
1	Set (11) Coarse Aggregate Sieves, brass, 12" diameter, with brass or stainless cloth, -- 37.5 mm, 25 mm, 19 mm, 16 mm, 12.5 mm, 9.5 mm, 6.3 mm, 4.75 mm, 2.36 mm, 1.18 mm, 75 µm (1 1/2", 1", 3/4", 5/8", 1/2", 3/8", 1/4", No. 4, No. 8, No. 16, No. 200) AASHTO M 92
1	<b>Additional 12" brass sieves are required for testing larger coarse aggregate. e.g. A 1 3/4" sieve is required for CA05 testing.</b>
1	<b>Wash Sieve, 12" diameter, No. 200, recommended Full Height (3")</b>
1	<b>Wash Sieve, 12" diameter, No. 16, recommended Full Height (3")</b>

**VENDOR LIST – For information only**

Baxter Healthcare Corp.  
Scientific Products Division  
1430 Waukegan Road  
McGraw Park, IL 60085-9988  
Phone: 800-633-7370

Humboldt Scientific, Inc.  
7300 West Agatite Avenue  
Norridge, IL 60656-4704  
Phone: 800-544-7220

Curtin Matheson  
Scientific, Inc. (CMS)  
1225 North Michael Drive  
Wood Dale, IL 60191  
Phone: 800-323-6572

Rainhart Co.  
604 William Street  
P. O. Box 4533  
Austin, TX 78765  
Phone: 800-628-0021

Gilson Company, Inc.  
P. O. Box 677  
Worthington, OH 43085-0677  
Phone: 800-431-5935

VWR Scientific  
O'Hare AMF  
P. O. Box 66929  
Chicago, IL 60666  
Phone: 800-932-5000

Greco Sales, Inc.  
901 East Adams Street  
Springfield, IL 62708  
Phone: 800-252-8522  
217-528-2548

## REQUIRED MINIMUM IDENTIFICATION MARKINGS FOR PRECAST CONCRETE PRODUCTS

Identification Marking	Pipe				Box Culvert	Drainage Structures	Bridge Beams	Bridge Three Sided Structure
	Reinforced	Non- Reinforced	Elliptical	Arch				
Producer Mark (Refer to Approved List)	X	X	X	X	X	X	X	X
AASHTO/ASTM Designation	X	X	X	X	X (Note 2)	X		
Class or Marking Required by Specification	X (Note 1)	X	X (Note 1)	X		X (Note 3)		
Date of Manufacture	X	X	X	X	X	X	X	X
Span, Rise, and Design Earth Cover					X			

Note 1: Pipe with quadrant reinforcement shall be marked with the letter "Q".

Note 2: If interstate loading is required for a precast concrete box culvert, an "I" shall be placed behind the AASHTO designation.  
For example, AASHTO M 259-I or M 273-I.

Note 3: Marking shall be "MH" for manhole base, riser, conical tops, and grade rings.

**MINIMUM REQUIRED QUALITY CONTROL SAMPLING & TESTING  
PRECAST CONCRETE PRODUCTS**

Precast Product	Specification Reference	QC Test/ Test Method <sup>1</sup> /Frequency
Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe (Includes Elbows and Tees)	Std. Spec. Art. 1040.03 AASHTO M 170	<b>Compressive Strength:</b> Cylinder – T 141 & T 280 (1) or Core T 280 (1) or <b>Crushing Strength:</b> Three-edge bearing – T 280 (1) <b>Slump</b> – T 141 & T 119 (2) <b>Air Content</b> – T 141 & T 152 or T 196 (2) <b>Absorption</b> – T 280 (3)
Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe (Includes Elbows and Tees)	Std. Spec. Art. 1040.05 AASHTO M 207	<b>Compressive Strength:</b> Cylinder – T 141 & T 280 (1) or Core – T 280 (1) or <b>Crushing Strength:</b> Three-edge bearing – T 280 (1) <b>Slump</b> – T 141 & T 119 (2) <b>Air Content</b> – T 141 & T 152 or T 196 (2) <b>Absorption</b> – T 280 (3)
Reinforced Concrete Arch Culvert Storm Drain, and Sewer Pipe (Includes Elbows and Tees)	Std. Spec. Art. 1040.07 AASHTO M 206	<b>Compressive Strength:</b> Cylinder – T 141 & T 280 (1) or Core – T 280 (1) or <b>Crushing Strength:</b> Three-edge bearing – T 280 (1) <b>Slump</b> – T 141 & T 119 (2) <b>Air Content</b> – T 141 & T 152 or T 196 (2) <b>Absorption</b> – T 280 (3)
Concrete Sewer, Storm Drain, and Culvert Pipe (Includes Elbows and Tees)	Std. Spec. Art. 1040.04 AASHTO M 86	<b>Crushing Strength:</b> Three-edge bearing – T 280 (1) <b>Slump</b> – T 141 & T 119 (2) <b>Air Content</b> – T 141 & T 152 or T 196 (2) <b>Absorption</b> – T 280 (3) <b>Permeability</b> – T 280 (3) <b>Hydrostatic</b> – T 280 (3)

Note 1: AASHTO test method unless indicated otherwise.

**MINIMUM REQUIRED QUALITY CONTROL SAMPLING & TESTING  
PRECAST CONCRETE PRODUCTS**

Precast Product	Specification Reference	QC Test/ Test Method <sup>1</sup> /Frequency
Concrete Drain Tile	Std. Spec. Art. 1040.06 AASHTO M 178	<b>Crushing Strength:</b> Three-edge bearing – T 280 (1) <b>Absorption – T 280 (3)</b>
Perforated Concrete Pipe (Includes Elbows and Tees)	AASHTO M 175 AASHTO M 86	<b>Compressive Strength:</b> Cylinder – T 141 & T 280 (1) or Core – T 280 (1) or <b>Crushing Strength:</b> Three-edge bearing – T 280 (1) <b>Slump – T 141 &amp; T 119 (2)</b> <b>Air Content – T 141 &amp; T 152 or T 196 (2)</b>
Reinforced Concrete Flared End Sections	Std. Spec. Art. 542.07(b) AASHTO M 170 Hwy. Standard 542301	<b>Compressive Strength:</b> Cylinder – T 141 & T 280 (1) or Core – T 280 (1) <b>Slump – T 141 &amp; T 119 (2)</b> <b>Air Content – T 141 &amp; T 152 or T 196 (2)</b>
Reinforced Concrete Elliptical Flared End Sections	Std. Spec. Art. 542.07(b) AASHTO M 207 Hwy. Standard 542306	<b>Compressive Strength:</b> Cylinder – T 141 & T 280 or Core – T 280 (1) <b>Slump – T 141 &amp; T 119 (2)</b> <b>Air Content – T 141 &amp; T 152 or T 196 (2)</b>
Reinforced Concrete Box Culvert Sections	Std. Spec. Art. 540.06 AASHTO M 259 AASHTO M 273	<b>Compressive Strength:</b> Cylinder – T 141 & T 280 (4) or Core – T 280 (5) <b>Slump – T 141 &amp; T 119 (2)</b> <b>Air Content – T 141 &amp; T 152 or T 196 (2)</b>

Note 1: AASHTO test method unless indicated otherwise.



**MINIMUM REQUIRED QUALITY CONTROL SAMPLING & TESTING  
PRECAST CONCRETE PRODUCTS**

Precast Product	Specification Reference	QC Test/ Test Method <sup>1</sup> /Frequency
Reinforced Concrete Box Culvert End Sections	Std. Spec. Art. 540.06 AASHTO M 259 AASHTO M 273 Hwy. Standards: 542001; 542101; 542106; 542111; 542116; 542121; 542201; 542206	<b>Compressive Strength:</b> Cylinder – T 141 & T 280 <b>(4)</b> or Core T 280 <b>(5)</b> <b>Slump</b> – T 141 & T 119 <b>(2)</b> <b>Air Content</b> – T 141 & T 152 or T 196 <b>(2)</b>
Reinforced Concrete Catch Basins: Type A Type B Type C Type D	Std. Spec. Art. 602.04 Std. Spec. Art. 1043.01 AASHTO M 199 Hwy. Standards: 602001; 602006; 602011; 602016; 602601 <sup>2</sup>	<b>Compressive Strength:</b> Cylinder – T 141 & T 280 <b>(1)</b> or Core – T 280 <b>(1)</b> <b>Slump</b> – T 141 & T 119 <b>(2)</b> <b>Air Content</b> – T 141 & T 152 or T 196 <b>(2)</b> <b>Absorption</b> – T 280 <b>(3)</b>
Reinforced Concrete Manhole Sections	Std. Spec. Art. 602.04 Std. Spec. Art. 1043.01 AASHTO M 199 Hwy. Standards: 602401; 602406	<b>Compressive Strength:</b> Cylinder – T 141 & T 280 <b>(1)</b> or Core – T 280 <b>(1)</b> <b>Slump</b> – T 141 & T 119 <b>(2)</b> <b>Air Content</b> – T 141 & T 152 or T 196 <b>(2)</b> <b>Absorption</b> – T 280 <b>(3)</b>
Inlet Boxes (Bridges & Culverts) Type 600A-G Type 900A Type 1200A Flush for Median	Std. Spec. Art. 542.07(d) Std. Spec. Art. 609.03 Hwy. Standards: Type 600A: 542501 Type 600B: 542506 Type 600C: 542511 Type 600D: 542516 Type 600E: 542521 Type 600F: 542526 Type 600G: 542531 Type 900A: 542536 Type 1200A: 542541 Flush Median: 542546	<b>Compressive Strength:</b> Cylinder – T 141 & T 280 <b>(1)</b> or Core – T 280 <b>(1)</b> <b>Slump</b> – T 141 & T 119 <b>(2)</b> <b>Air Content</b> – T 141 & T 152 or T 196 <b>(2)</b> <b>Absorption</b> – T 280 <b>(3)</b>

Note 1: AASHTO test method unless indicated otherwise.

Note 2: Highway Standard 602601 (Precast Reinforced Concrete Flat Slab Top) may be used in lieu of the tapered tops shown on Highway Standards 602001 (Catch Basin Type A), 602011 (Catch Basin Type C), 602306 (Inlet-Type B), 602401 (Manhole Type A), and 602501 (Valve Vault Type A).

**MINIMUM REQUIRED QUALITY CONTROL SAMPLING & TESTING  
PRECAST CONCRETE PRODUCTS**

Precast Product	Specification Reference	QC Test/ Test Method <sup>1</sup> /Frequency
Inlets (Drainage) Type A Type B	Std. Spec. Art. 602 Std. Spec. Art. 1043.01 AASHTO M 199 Hwy. Standards: Type A: 602301 Type B: 602306	<b>Compressive Strength:</b> Cylinder – T 141 & T 280 <b>(1)</b> or Core T 280 <b>(1)</b> <b>Slump</b> – T 141 & T 119 <b>(2)</b> <b>Air Content</b> – T 141 & T 152 or T 196 <b>(2)</b> <b>Absorption</b> – T 280 <b>(3)</b>
Valve Vault, Type A	Std. Spec. Art. 602 Std. Spec. Art. 1043.01 AASHTO M 199 Hwy. Standard: 602501	<b>Compressive Strength:</b> Cylinder – T 141 & T 280 <b>(1)</b> or Core – T 280 <b>(1)</b> <b>Slump</b> – T 141 & T 119 <b>(2)</b> <b>Air Content</b> – T 141 & T 152 or T 196 <b>(2)</b> <b>Absorption</b> – T 280 <b>(3)</b>
Drainage Structures Type 1, 2, 3, 4, 5 & 6	Std. Spec. Section 602 Hwy. Standards: 602101; 602106	<b>Compressive Strength:</b> Cylinder – T 141 & T 280 <b>(1)</b> or Core – T 280 <b>(1)</b> <b>Slump</b> – T 141 & T 119 <b>(2)</b> <b>Air Content</b> – T 141 & T 152 or T 196 <b>(2)</b> <b>Absorption</b> – T 280 <b>(3)</b>
Precast Bridge Beams	Std. Spec. Art. 504.05	<b>Compressive Strength:</b> Cylinder – T 141 & T 280 <b>(6)</b> <b>Slump</b> – T 141 & T 119 <b>(2)</b> <b>Air Content</b> – T 141 & T 152 or T 196 <b>(2)</b>
Three Sided Precast Concrete Structures	Std. Spec. Art. 504.05 Special Provision	<b>Compressive Strength:</b> Cylinder – T 141 & T 280 <b>(6)</b> <b>Slump</b> – T 141 & T 119 <b>(2)</b> <b>Air Content</b> – T 141 & T 152 or T 196 <b>(2)</b>

Note 1: AASHTO test method unless indicated otherwise.

**MINIMUM REQUIRED QUALITY CONTROL SAMPLING & TESTING  
PRECAST CONCRETE PRODUCTS**

Precast Product	Specification Reference	QC Test/ Test Method <sup>1</sup> /Frequency
Precast Concrete Piles	Std. Spec. Art. 512.03	<b>Compressive Strength:</b> Cylinder – T 141 & T 280 <b>(6)</b> <b>Slump</b> – T 141 & T 119 <b>(2)</b> <b>Air Content</b> – T 141 & T 152 or T 196 <b>(2)</b>
Precast Concrete Pile Caps	Std. Spec. Art. 504.05	<b>Compressive Strength:</b> Cylinder – T 141 & T 280 <b>(6)</b> <b>Slump</b> – T 141 & T 119 <b>(2)</b> <b>Air Content</b> – T 141 & T 152 or T 196 <b>(2)</b>
Precast Bridge Slabs	Std. Spec. Art. 504.05	<b>Compressive Strength:</b> Cylinder – T 141 & T 280 <b>(6)</b> <b>Slump</b> – T 141 & T 119 <b>(2)</b> <b>Air Content</b> – T 141 & T 152 or T 196 <b>(2)</b>
Mechanically Stabilized Earth (MSE) Retaining Walls	Special Provision	<b>Compressive Strength:</b> Cylinder – T 141 & T 280 <b>(1)</b> <b>Slump</b> – T 141 & T 119 <b>(2)</b> <b>Air Content</b> – T 141 & T 152 or T 196 <b>(2)</b>
Noise Abatement Walls	Std. Spec. Art. 504.05 Special Provision	<b>Compressive Strength:</b> Cylinder – T 141 & T 280 <b>(1)</b> <b>Slump</b> – T 141 & T 119 <b>(2)</b> <b>Air Content</b> – T 141 & T 152 or T 196 <b>(2)</b>
Concrete Masonry Units	Std. Spec. Art. 1042.01 ASTM C 139 (Solid) ASTM C 90 (Hollow)	<b>Compressive Strength</b> – ASTM C 140 <b>(7)</b> <b>Absorption</b> – ASTM C 140 <b>(7)</b>

Note 1: AASHTO test method unless indicated otherwise.

**MINIMUM REQUIRED QUALITY CONTROL SAMPLING & TESTING  
PRECAST CONCRETE PRODUCTS**

Precast Product	Specification Reference	QC Test/ Test Method <sup>1</sup> /Frequency
Segmental Concrete Block Walls	Special Provision ASTM C 1372	<b>Compressive Strength</b> – ASTM C 140 (7) <b>Absorption</b> – ASTM C 140 (7)
Erosion Control: Precast Block Revetment Mats	Special Provision or Supplemental Spec. Section 285 Article 1005.03	<b>Compressive Strength:</b> Cylinder (Wet Cast) – T 141, T 22 & T 23 (7) Coupon (Dry Cast) – ASTM C 140 (7) <b>Air Content</b> – T 141 & T 152 or T 196 (2) <b>Absorption</b> – ASTM C 140 (7) <b>Density</b> – ASTM C 140 (7) <b>Freeze/Thaw</b> – ASTM C 67 or C 1262 (3)
Erosion Control: Precast Articulated Block Revetment Mats	Special Provision or Supplemental Spec. Section 285 Article 1005.03	<b>Compressive Strength:</b> Cylinder (Wet Cast) – T 141, T 22 & T 23 (7) Coupon (Dry Cast) – ASTM C 140 (7) <b>Air Content</b> – T 141 & T 152 or T 196 (2) <b>Absorption</b> – ASTM C 140 (7) <b>Density</b> – ASTM C 140 (7) <b>Freeze/Thaw</b> – ASTM C 67 or C 1262 (3)
Concrete Building Bricks	Std. Spec. Art. 1041.02 ASTM C 55	<b>Compressive Strength</b> – ASTM C 140 (7) <b>Absorption</b> – ASTM C 140 (7) <b>Linear Drying Shrinkage</b> – ASTM C 426 (8)
Concrete Pavers	Special Provision or Supplemental Spec. Art. 1041.04 ASTM C 936	<b>Compressive Strength</b> – ASTM C 140 (7) <b>Absorption</b> – ASTM C 140 (7) <b>Freeze/Thaw</b> – ASTM C 67 (3) <b>Abrasion Resistance</b> – ASTM C 418 (3)
Concrete Barriers	Std. Spec. Section 637	<b>Compressive Strength:</b> Cylinder – T 141 & T 280 (9) or Core – T 280 (9) <b>Slump</b> – T 141 & T 119 (2) <b>Air Content</b> – T 141 & T 152 or T 196 (2)
Temporary Concrete Barriers	Std. Spec. Section 704 Special Provision Hwy. Standard: 704001	<b>Compressive Strength:</b> Cylinder – T 141 & T 280 (9) or Core – T 280 (9) <b>Slump</b> – T 141 & T 119 (2) <b>Air Content</b> – T 141 & T 152 or T 196 (2)

Note 1: AASHTO test method unless indicated otherwise.

**MINIMUM REQUIRED QUALITY CONTROL SAMPLING & TESTING  
PRECAST CONCRETE PRODUCTS**

Precast Product	Specification Reference	QC Test/ Test Method <sup>1</sup> /Frequency
Concrete Headwalls For Pipe Drains	Std. Spec. Art. 601.05 Std. Spec. Art. 504.05 Hwy. Standard: 601101	<b>Compressive Strength:</b> Cylinder – T 141 & T 280 (1) <b>Slump – T 141 &amp; T 119 (2)</b> <b>Air Content – T 141 &amp; T 152 or T 196 (2)</b>
Right of Way Markers	Std. Spec. Section 666 Hwy. Standard: 666001	<b>Compressive Strength:</b> Cylinder – T 141 & T 280 (1) <b>Slump – T 141 &amp; T 119 (2)</b> <b>Air Content – T 141 &amp; T 152 or T 196 (2)</b>
Drainage Markers	Std. Spec. Section 667 Hwy. Standard: 667001	<b>Compressive Strength:</b> Cylinder – T 141 & T 280 (1) <b>Slump – T 141 &amp; T 119 (2)</b> <b>Air Content – T 141 &amp; T 152 or T 196 (2)</b>
Permanent Survey Markers	Std. Spec. Section 667 Hwy. Standard: 667101	<b>Compressive Strength:</b> Cylinder – T 141 & T 280 (1) <b>Slump – T 141 &amp; T 119 (2)</b> <b>Air Content – T 141 &amp; T 152 or T 196 (2)</b>
Section Markers	BLR 06	<b>Compressive Strength:</b> Cylinder – T 141 & T 280 (1) <b>Slump – T 141 &amp; T 119 (2)</b> <b>Air Content – T 141 &amp; T 152 or T 196 (2)</b>
Bumper Blocks (For Cars)	Special Provision	<b>Compressive Strength:</b> Cylinder – T 141 & T 280 (1) <b>Slump – T 141 &amp; T 119 (2)</b> <b>Air Content – T 141 &amp; T 152 or T 196 (2)</b>
Concrete Junction Boxes	Std. Spec. Section 813 Std. Spec. Art. 1088.06 Hwy. Standard: 813001	<b>Compressive Strength:</b> Cylinder – T 141 & T 280 (1) <b>Slump – T 141 &amp; T 119 (2)</b> <b>Air Content – T 141 &amp; T 152 or T 196 (2)</b>

Note 1: AASHTO test method unless indicated otherwise.

**MINIMUM REQUIRED QUALITY CONTROL SAMPLING & TESTING  
PRECAST CONCRETE PRODUCTS**

Precast Product	Specification Reference	QC Test/ Test Method <sup>1</sup> /Frequency
Handholes	Std. Spec. Section 814 Std. Spec. Art. 1088.10 Hwy. Standard: 814001; 814006	<b>Compressive Strength:</b> Cylinder – T 141 & T 280 <b>(1)</b> <b>Slump</b> – T 141 & T 119 <b>(2)</b> <b>Air Content</b> – T 141 & T 152 or T 196 <b>(2)</b>
Decorative Bridge Structural Elements	Special Provision	<b>Compressive Strength:</b> Cylinder – T 141 & T 280 <b>(6)</b> <b>Slump</b> – T 141 & T 119 <b>(2)</b> <b>Air Content</b> – T 141 & T 152 or T 196 <b>(2)</b>
Picnic Tables, Trash Receptacles, Planters	Special Provision	<b>Compressive Strength:</b> Cylinder – T 141 & T 280 <b>(1)</b> <b>Slump</b> – T 141 & T 119 <b>(2)</b> <b>Air Content</b> – T 141 & T 152 or T 196 <b>(2)</b>
All	Various	<b>Temperature</b> – T 141 & T 309 <b>(10)</b>

Note 1: AASHTO test method unless indicated otherwise.

**NOTES**

1. The minimum frequency shall be one test per week. A single test (two cylinders, one core, or one three-edge-bearing) may apply to multiple classes and sizes of precast products produced for the week, provided the same mix design, casting method, and curing method is used to produce the various classes and sizes.
2. The minimum frequency per day shall be to test the first load of concrete, thereafter as needed to control production. The air content test is not required for dry cast products.
3. The minimum frequency shall be one test per year.
4. The minimum frequency shall be not less than five test cylinders from a group (one day's production of each concrete strength) of box sections.
5. The minimum frequency shall be one core from a box section, selected at random from each group of fifteen box sections of a single size or fraction of such a group from each continuous production run.
6. A minimum of four test cylinders of concrete shall be made for each seven units, or a minimum of four test cylinders per day shall be made if less than seven units are constructed.
7. A minimum of six units shall be selected from each ten thousand units or fraction thereof contained in the lot, but no less than six units tested per month.
8. The minimum frequency shall be one test every two years.
9. The minimum frequency shall be one core or four test cylinders per day.
10. As needed to control production.

## ILLINOIS DEPARTMENT OF TRANSPORTATION

QUALITY CONTROL/QUALITY ASSURANCE PROGRAM ADDENDUM FOR  
PRECAST CONCRETE PRODUCTS USING SELF-CONSOLIDATING CONCRETE

Effective: January 1, 2005

## DEFINITIONS

**DESIGN SLUMP FLOW RANGE** – The slump flow range in which a specific Self-Consolidating Concrete (SCC) mix design may be used. The top and bottom extremes for this range are determined during SCC mix design development, and shall be within applicable specification limits. As an example, a mix design may have a **Design Slump Flow Range** of 20 to 28 inches, and be used for several different products. Another mix design may have a **Design Slump Flow Range** of 23 to 26 inches and be used for a limited number of products.

**HARDENED VISUAL STABILITY INDEX (HVSİ)** – A visual rating of the static segregation resistance of an SCC mixture as determined by Illinois Test Procedure SCC-6, “Standard Test Method for Static Segregation of Hardened Hydraulic-Cement Self-Consolidating Concrete Cylinders.”

**PRODUCT SLUMP FLOW RANGE** – The slump flow range for a specific product, selected by the Producer and approved by the Engineer. The range shall be no more than 4 inches. The **Product Slump Flow Range** must be within the approved **Design Slump Flow Range** for the mix design, as well as applicable specification limits.

**SCC TRIAL BATCH** – A batch of SCC tested by the Producer and witnessed by the Engineer to verify the SCC mix design will meet specification requirements.

**SCC TRIAL MIXTURE** – A batch of SCC tested by the Producer to develop the mix design proportions and **Design Slump Flow Range**.

**VISUAL STABILITY INDEX (VSI)** – A visual rating of the dynamic segregation resistance of an SCC mixture as determined by Illinois Test Procedure SCC-2, “Standard Test Method for Slump Flow and Stability of Hydraulic-Cement Self-Consolidating Concrete.”

**SCC-1.0 APPLICATION**

The use of Self-Consolidating Concrete (SCC) in precast items is a new technology that has only recently been allowed by the Department. This document outlines the requirements for the Producer, and for the Department quality assurance testing and acceptance of SCC used in precast products.

The Producer shall submit an addendum to the approved Quality Control Plan to describe the use of Self-Consolidating Concrete (SCC). The addendum shall conform to the minimum requirements of the attached “Model Quality Control Plan Addendum for Precast Concrete Products Using Self-Consolidating Concrete” (Attachment” (Attachment SCC-A).

**SCC-2.0 APPROVAL OF ADDENDUM**



A Producer may request approval to use SCC to produce Precast Concrete Products by submitting the following documentation:

1. A Quality Control Plan Addendum conforming to the minimum requirements in Attachment SCC-A.
2. **SCC Trial Mixture** data for each SCC mix design submitted for approval.

The evaluation of all requests for approval of the addendum for using SCC will be conducted by the District or Bureau of Materials and Physical Research (Bureau). The evaluation will consist of the following:

1. Inspection and approval of the Producer's SCC test equipment. A list of the required SCC test equipment is provided in Attachment SCC-B.
2. Evaluation and approval of the Producer's proposed Quality Control Plan Addendum.
3. Review of the **SCC Trial Mixture** data for each mix design.
4. Observation of **SCC Trial Batches** for each SCC mix design.
5. Evaluation and approval of the Producer's proposed SCC mix design(s).

After the District or Bureau has determined the approval or denial of the Producer's addendum for using SCC mixtures, the District or Bureau will notify the Producer.

### **SCC-3.0 CONTINUED APPROVAL OF PRODUCER'S USE OF SCC MIXTURES FOR PRECAST CONCRETE PRODUCTS**

The Engineer reserves the right to suspend the use of SCC mixtures for precast products based on unacceptable test results, the quality of finished products, or other reasons as determined by the Engineer.

### **SCC-4.0 DEPARTMENT'S RESPONSIBILITIES – QUALITY ASSURANCE**

In addition to the responsibilities listed in the Policy Memorandum, the following will be performed by the District or Bureau.

1. Witness Quality Control testing a minimum of once per month when SCC mixtures are used. The District or Bureau may conduct Quality Assurance split sample testing for any of the SCC test methods.
2. Verify all of the Producer's cut cylinder Hardened Visual Stability Index (HVSI) values a minimum of once per month.
3. The District or Bureau may require coring of a product corresponding with an unacceptable Producer or Department test result, as well as those subsequently produced with the same mix design.

**SCC-5.0 QUALITY CONTROL PROGRAM - FACILITIES**

Equipment listed in Attachment SCC-B shall be required.

**SCC-6.0 SCC MIX DESIGN APPROVAL**

The SCC mix design approval process shall include two steps: submittal of **SCC Trial Mixture** data, and performance of two **SCC Trial Batches** for each mix design.

The Producer shall perform **SCC Trial Mixtures** in order to establish the proportions and **Design Slump Flow Range** of the SCC mix design. The Producer shall provide data from at least one **SCC Trial Mixture** that includes results from the following test methods: Illinois Test Procedures SCC-1, 2, 3, 4, 5, and 6 (except the yield test shall be optional); and Illinois Modified ASTM C 1064 (AASHTO T 309). The tests shall include a minimum of two cylinders tested for compressive strength at 28 days. The slump flow shall be at the midpoint of the proposed **Design Slump Flow Range** ( $\pm 1$  inch).

The following information shall be included in the **SCC Trial Mixture** data:

1. Source of all materials.
2. Gradation test results for each fine and coarse aggregate.
3. Aggregate specific gravity values (provided by the District or Bureau).
4. **Design Slump Flow Range**.
5. Target air content and mix design specification strength.
6. Material proportions, ranges of water/cement ratio, and ranges of admixture dosage rates for **Design Slump Flow Range**.
7. Exact material proportions, water/cement ratio, and admixture dosage rates for the **SCC Trial Mixture** performed at the midpoint and used for conducting the required tests.
8. **SCC Trial Mixture** test results for the required tests.
9. Mixer to be used for the mix design, charging sequence, and mixing time. The mixer used for the **SCC Trial Mixture** shall be the same mixer that will be used during production.

Upon review and approval of the **SCC Trial Mixture** data by the District or Bureau, the Producer shall coordinate the scheduling of the **SCC Trial Batches** with the District or Bureau.

Each SCC mix design shall require a minimum of two **SCC Trial Batches**. The **SCC Trial Batches** shall demonstrate the robustness of the mix design by varying the water and admixture separately. Each **SCC Trial Batch** shall be a minimum of one cubic yard. If the mixer has a capacity less than one cubic yard, then the volume of the **SCC Trial Batch** shall be no less than the capacity of the mixer. **SCC Trial Batches** shall be conducted according to specifications and the following:

1. The same test methods required for the **SCC Trial Mixture** shall be used to evaluate the **SCC Trial Batches**. The mixer used for the **SCC Trial**

**Batches** shall be the same mixer that will be used during production, and the mixing time and charging sequence shall be reported.

2. The Visual Stability Index (VSI) shall be a maximum of 1. Passing ability and dynamic segregation resistance shall be evaluated using the L-box and J-ring test methods. The minimum L-box blocking ratio shall be 60 percent. The maximum J-ring Value shall be 4 inches. Alternative L-box blocking ratio and J-ring Value limits may be accepted with approval of the Engineer.
3. Static segregation resistance shall be evaluated using the column technique and the cut cylinder test method. The column Segregation Index shall be a maximum of 15 percent. The cut cylinder HVSI shall be a maximum of 1.
4. Gradation testing shall be performed for each aggregate.

Upon review of the test data from the **SCC Trial Batches**, the District or Bureau will notify the Producer of the approval or denial of the SCC mix design. An approved SCC mix design may be used with the condition that it continues to perform satisfactorily during all of its applications within the approved **Design Slump Flow Range**. An **SCC Trial Batch** is required whenever there is a change in the source of any component material, proportions, mixing time, mixer, charging sequence, or as determined by the Engineer. The testing criteria for the new **SCC Trial Batch** shall be determined by the Engineer. Minor adjustments to admixture dosage rates, as determined by the Engineer, or an increase in mixing time, will be allowed without a new **SCC Trial Batch**. The Engineer may require that a new SCC mix design be submitted when the Producer proposes significant changes, as determined by the Engineer.

## **SCC-7.0 QUALITY CONTROL PROGRAM – MINIMUM QUALITY CONTROL SAMPLING AND TESTING**

In addition to the requirements in the Policy Memorandum, the following sampling and testing procedures and frequencies are required for all products when using an SCC mixture.

1. Slump flow, VSI, and J-ring tests shall be performed on the first batch of the day, plus once every 50 yd<sup>3</sup> thereafter. The L-box test may be used as a substitute for the J-ring test. The maximum VSI shall be 1. The maximum J-ring Value shall be 4 inches. The minimum L-box blocking ratio shall be 60 percent. Alternative J-ring Value and L-box blocking ratio limits may be accepted with approval of the Engineer. The slump flow shall be within the **Product Slump Flow Range** and applicable specifications (20 to 28 inches).
2. The Producer shall test coarse and fine aggregate stockpile moisture contents for each gradation according to Illinois Modified AASHTO T 255, Flask Method (fine aggregate only), Dunagan Method, or Pycnometer Jar Method, as described in the "Manual of Test Procedures for Materials." Each coarse aggregate shall be tested as needed to control production. Each fine aggregate shall be tested once per week when a moisture sensor is used, otherwise daily.
3. The Producer shall cast a minimum of 2 cut cylinders in the first batch of the week, and a minimum of once every 300 yd<sup>3</sup> thereafter for visual assessment of stability. The maximum HVSI shall be 1 for each cylinder.

Slump flow, VSI, air content, and concrete temperature shall be recorded for each set of cylinders.

4. The Producer shall measure temperature as needed to control production, and as required for Illinois Test Procedures SCC-1 and SCC-6.
5. The Producer shall take immediate corrective action whenever there is an occurrence of unacceptable test results.
6. The Producer shall retain all cut cylinder specimens and corresponding documentation until the District or Bureau notifies the Producer that the specimens may be discarded.
7. The Producer shall continuously observe the SCC mixture for the presence of cement balls/conglomerations. If there is a repeated occurrence of cement balls or conglomerations of unmixed ingredients, immediate corrective action shall be taken. Corrective action may include increasing mixing time or changing the charging sequence. Occasional cement balls/conglomerations shall be removed by the Producer.

#### **SCC-8.0     QUALITY CONTROL PROGRAM – VISUAL INSPECTION**

In addition to the minimum guidelines listed in the Policy Memorandum, the following shall apply to products made with SCC.

**LAYERING** – If there is an indication of separate layers (i.e. a distinct change in coloration, etc.), the product may be rejected. However, differences in coloration caused by the condition of the forms, form release agent or the form release application method shall not be cause for rejection.

**FOLDS** – If there is a visible fold in the product (similar to a cold joint), the product shall be rejected. Folds are typically caused by improper placing techniques or a delay during placement of successive lifts of concrete. A subsequent lift of concrete shall be vibrated together with the previous lift when it appears to be flowing over the previous lift.

**WEAK SURFACE** – If the top surface (as cast) is weak and can be easily scratched in a dry condition and after reaching final strength, the product shall be rejected.

In any case where a product is rejected due to layering, folds, or weak surface, the Producer may propose to core the product to determine if it is acceptable.

ILLINOIS DEPARTMENT OF TRANSPORTATION

MODEL QUALITY CONTROL PLAN ADDENDUM FOR PRECAST CONCRETE PRODUCTS  
USING SELF-CONSOLIDATING CONCRETE

Effective: January 1, 2005

Producer: \_\_\_\_\_  
P.O. Box: \_\_\_\_\_  
Street Address: \_\_\_\_\_  
City/State/Zip Code: \_\_\_\_\_  
Phone No.: \_\_\_\_\_  
Fax No.: \_\_\_\_\_  
Name of Plant or No.: \_\_\_\_\_

PRODUCER RESPONSIBILITIES

This Quality Control Plan addendum modifies the approved Quality Control Plan for (insert name of firm/corporation), dated (insert date of latest approved plan). This addendum explains how the Producer proposes to control the equipment, materials, and production methods to ensure the specified product is attained using Self-Consolidating Concrete (SCC).

The Producer agrees to read, understand, abide, and implement all the requirements in the Department's "Quality Control/Quality Assurance Program Addendum for Precast Concrete Products Using Self-Consolidating Concrete," which will be considered part of this Quality Control Plan addendum.

PRODUCER'S ACKNOWLEDGEMENT

(Insert name of firm/corporation) desires to obtain advance approval of materials to be supplied to Department of Transportation contractors as more fully described herein. I and the company understand that the Department of Transportation reserves the right in its contracts to approve materials at the source of supply as provided in Article 106.01 of the Standard Specifications for Road and Bridge Construction. I and the company further understand that approval of company supplied material pursuant to this request does not constitute a contract to supply material to the State of Illinois or any of its contractors. In consideration of approval, I and the company agree to the terms, conditions, and performance standards of the Standard Specifications for Road and Bridge Construction and Policy Memorandum 05-01, "Quality Control/Quality Assurance Program for Precast Concrete Products," a copy of which has been received.

I. PRODUCER PRODUCTS OR PRODUCT LINES

INSTRUCTIONS: List products or product lines to be manufactured using SCC. List the SCC mix design and **Product Slump Flow Range** for each product. Describe the placement method for each product when using an SCC mixture. The description shall include the location(s) for depositing the concrete and the freefall distance.

II. CONCRETE PLANT AND DELIVERY TRUCKS

INSTRUCTIONS: Indicate the approved plant where the SCC mixture will be produced.

III. SCC MIX DESIGNS

INSTRUCTIONS: For new mix designs, provide all required information according to the Department's "Quality Control/Quality Assurance Program Addendum for Precast Concrete Products Using Self-Consolidating Concrete" and all applicable specifications.

IV. PRODUCER SAMPLING AND TESTING

INSTRUCTIONS: If the Producer will use a test frequency higher than that specified in the Policy Memorandum and Section SCC-7.0 in the Program Addendum, indicate this higher test frequency for each precast SCC product.

V. AGGREGATE MATERIALS FOR SCC MIX DESIGNS

INSTRUCTIONS: Indicate any additional material sources for the coarse and fine aggregates used in approved SCC mix designs, if not listed in the current plan.

VI. SCC ADMIXTURES

INSTRUCTIONS: The wording is provided for the Producer as indicated below.

The SCC admixtures will be obtained from the "Approved List of Concrete Admixtures."

VII. OTHER CHANGES FOR SCC PRODUCTS

INSTRUCTIONS: Indicate any other changes in procedures (i.e. inspection, curing, etc.) that will be followed when using SCC for precast concrete products.

**INSTRUCTIONS:**

To be completed by Producer. Return with Quality Control Plan Addendum.

**QUALITY CONTROL PLAN SIGNATURE SHEET**

**(IF AN INDIVIDUAL)**

Firm Name \_\_\_\_\_

Signature of Owner \_\_\_\_\_

Business Address: \_\_\_\_\_

P.O. Box: \_\_\_\_\_

Street Address: \_\_\_\_\_

City/State/Zip Code: \_\_\_\_\_

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**(IF A CO-PARTNERSHIP)**

Firm Name \_\_\_\_\_

Signature of Partner \_\_\_\_\_

Business Address: \_\_\_\_\_

P.O. Box: \_\_\_\_\_

Street Address: \_\_\_\_\_

City/State/Zip Code: \_\_\_\_\_

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**(IF A CORPORATION)**

Corporate Name \_\_\_\_\_

Signature of Corporate Officer \_\_\_\_\_

Business Address: \_\_\_\_\_

P.O. Box: \_\_\_\_\_

Street Address: \_\_\_\_\_

City/State/Zip Code: \_\_\_\_\_

**MINIMUM REQUIRED TEST EQUIPMENT  
FOR PRECAST CONCRETE PLANT OPERATIONS  
WHEN USING SELF-CONSOLIDATING CONCRETE**

1. Slump Flow equipment and Base Plate according to Illinois Test Procedure SCC-2.
2. J-Ring test equipment and Base Plate according to Illinois Test Procedure SCC-3, **or** L-Box test equipment according to Illinois Test Procedure SCC-4. **(Note 1) (Note 3)**
3. Column Mold, Base Plate, Collector Plate, and 4.75 mm (No. 4) Sieve according to Illinois Test Procedure SCC-5. **(Note 2) (Note 3)**
4. Thermometer according to Illinois Modified ASTM C 1064 (AASHTO T 309).
5. Cylinder Molds, 152 x 305 mm (6 x 12 in.), according to Illinois Modified AASHTO M 205. **(Note 4)**
6. Compression test machine for testing cylinders or cores according to Illinois Modified AASHTO T 22.
7. Air meter equipment according to Illinois Modified AASHTO T 152 or Illinois Modified AASHTO T 196.
8. Saw – The saw shall have a diamond or silicon-carbide cutting edge and shall be capable of cutting specimens without excessive heating or shock.
9. Core Drill – The core drill shall have diamond impregnated bits attached to a core barrel. **(Note 4)**
10. Balance – A balance according to Illinois Specification 101 for portland cement concrete unit weight measurements.
11. Measuring Tape – The measuring tape shall have a minimum gradation of 10 mm (0.5 in.).
12. Stopwatch – The stopwatch shall have a minimum reading of 0.2 seconds.
13. Aggregate moisture test equipment. Refer to Illinois Modified AASHTO T 255, Flask Method (fine aggregate only), Dunagan Method, or Pycnometer Jar Method.
14. Tools including wheelbarrow, shovel, hand scoop or equivalent, and trowel.

Note 1: J-ring test equipment **and** L-Box test equipment are required for **SCC Trial Mixtures** and **SCC Trial Batches only**. Only one is required during production for minimum quality control testing of an **SCC Mix Design**.

Note 2: Column test equipment is required for **SCC Trial Mixtures** and **SCC Trial Batches only**.

Note 3: The Department will allow test equipment for **SCC Trial Mixtures** and **SCC Trial Batches** to be provided for the Producer's use by a third party, such as an admixture company.

Note 4: Equipment may be optional. For example, cylinders are tested for strength in lieu of cores, or a core drill is necessary when cores are used to determine strength or static segregation resistance.